REMARKS

In the Office Action, the Examiner rejected Claims 1-20, which are all of the pending claims. Over the prior art, principally U.S. Patent 5,513,029 (Roberts). In particular, Claims 3, 7-11 and 15-17 were rejected under 35 U.S.C. 102 as being fully anticipated by Roberts; and Claims 1, 2, 4-6, 12-14 and 18-20 were rejected under 35 U.S.C. 103 as being unpatentable over Roberts in view of U.S. Patent 6,208,441 (Jones, et al.). Claim 3 was further rejected under 35 U.S.C. 112, second paragraph, as being indefinite, and Claims 11 and 18 were also rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement.

The rejections of the claims under 35 U.S.C. 102 and 103 are respectfully traversed for the reasons set forth below. Also, Applicants herein ask that Claims 1, 3, 11 and 18 be amended to emphasize differences between the claims and the prior art and to address the rejections of claims 3, 11 and 18 under 35 U.S.C. 112.

For the reasons discussed below, Claims 3, 11 and 18, as presented herewith, fully comply with the requirements of 35 U.S.C. 112 and all of Claims 1-20 patentably distinguish over the prior art. The Examiner is thus asked to enter this Amendment, to reconsider and to withdraw the rejection of Claims 3, 11 and 18 under 35 U.S.C. 112 and the rejections of Claims 1-20 under 35 U.S.C. 102 and 103, and to allow claims 1-20.

In rejecting Claim 3 under 35 U.S.C. 112, the Examiner objected to the phrase "dither the center wavelengths of each of said set of signals." The Examiner argued that this phrase is confusing because only one set of signals is claimed. To address this objection, Applicants herein ask that this phrase in Claim 3 be changed to read: "dither the center wavelength of each

signal of said set of signals." In this way, it is clear that what is being dithered is the center wavelength of each signal - that is, there is a set of signals, and the wavelength of each signal of that set is being dithered. It is believed that Claim 3 is now clear and definite and fully satisfies the requirements of 35 U.S.C. 112. The Examiner is, accordingly, asked to reconsider and to withdraw the rejection of Claim 3 under 35 U.S.C. 112, second paragraph.

With respect to the rejection of Claims 11 and 18 under 35 U.S.C. 112, the Examiner objected to the phrase "means...to pass said set of optical signals...through the filter." The Examiner argued that the specification does not disclose filter bandpass where the one bandpass filter filters multiple channels/wavelengths as a set of signals.

In response, Applicants are herein amending Claims 11 and 18 so that the above phrase reads: "means...to pass each signal of said set of optical signals...through the filter." With this language, it is clear that the filter filters each of the optical signals – that is, there is a set of optical signals, and the filter filters each of the signals of that set of signals. Procedures for passing optical signals through the filter are discussed at several places in the specification, including page 6, line 30 to page 7, line 8, and are shown in Figure 7. These portions of the application provide the appropriate written description for the above quoted language from Claims 8 and 11.

In light of the above-discussion and the changes to Claims 3 and 8 being made herein, these claims comply with the requirements of 35 U.S.C. 112, and the Examiner is asked to reconsider and to withdraw the rejection of Claims 3 and 8 under 35 U.S.C. 112.

In addition, Applicants respectfully traverse the rejection of all of Claims 1-20 under 35 U.S.C. 102 and 103 because the prior art, including Roberts, does not disclose or suggest equalizing the optical signals by adjusting the wavelengths of those signals.

With particular regard to Roberts, it is important to emphasize that Roberts teaches adjusting the <u>amplitude</u> of the signal, not the <u>wavelength</u>.

In order to best understand this difference and its significance, it may be helpful to review briefly this invention and the prior art.

The present invention, generally, relates to optical networks that carry multiple optical signals at multiple wavelengths. In the present invention, optical networks encode information to be transmitted and received, and a stable optical power level is vital to set and maintain the threshold of the code for digital data. Various schemes have been tried to achieve this stable optical power level. However, these approaches are often inaccurate and expensive, especially in networks that carry many wavelengths with dense wavelength spacing.

The inventors of the instant invention have developed a mechanism and method to achieve this stable optical power level through the unique use of an optical filter. To elaborate, in accordance with this invention, the multiple wavelengths, each in an associated channel, in the network are dithered about the central wavelengths of the channels, and directed through the optical filter to obtain a measurement of the optical transfer function in the network at any instant in real time. Any changes in the optical transfer function can be tracked, and feedback signals are used to compensate for those changes.

The filter, in effect, functions as part of a very inexpensive real time optical spectrum analyzer. This, in turn, allows for very fast response corrections and enables the use of networks with more wavelengths spaced more closely together.

Roberts discloses a system for monitoring the performance of optical transmission systems. An optical signal is modulated with a low frequency dither signal to provide a modulated optical signal having a known modulation depth. A portion of the optical signal is

tapped, and both a total power and a dither amplitude of the tapped portion of the optical signal are measured.

It is important to emphasize that Roberts does not disclose wavelength locking, but rather a feedback loop to control the power, not the wavelength of a laser source. Roberts encodes the optical dither with a pseudorandom signal, while the instant invention requires only a periodic, sinusoidal modulation. In fact, Roberts is controlling the optical POWER, NOT WAVELENGTH, of laser sources by direct modulation of the drive current. The present invention adjusts laser wavelength with respect to the peak of a passband filter. Thus, Roberts does not actually perform wavelength locking at all with his approach.

The cited reference for Roberts describes how an ENCODED dither signal may be deciphered to recover certain aspects of the signal spectrum using a digital microcontroller. The present invention does not require an ENCODED dither signal and does not require a microcontroller, yet it achieves wavelength locking.

It is noted that Roberts teaches a WDM system in which each laser transmitter (operating at a different wavelength) is dithered at a low frequency; later, the signals are tapped so that total power and signal-to-noise measurements can be taken for each wavelength (col. 4 lines 5-20). Roberts dithers the <u>amplitude</u> of each signal, not the <u>wavelength</u>. Roberts is concerned with measuring performance of an optical transmission system, to make signal power measurements (col. 3 lines 4-14). Roberts does not have wavelength or frequency control of either the laser or filter as an object or an outcome of his invention.

Roberts states that each wavelength in a WDM system is produced by a different laser, and that each laser is modulated with a unique encoded low frequency dither signal; in this way, the different dither signals can be used to distinguish one wavelength from another.

Roberts refers to this as "dither signals…encode the wavelengths of the optical transmitters" and states in the cited text that "dither signals which encode distinct transmitter wavelengths …ensure that the dither amplitudes of signals at distinct wavelengths are separately measurable". This should not be confused with the operation of the present invention, which does not dither signal amplitude (as in Roberts) but rather dithers signal wavelength. Roberts does not change the laser wavelength; he simply encodes each wavelength with a dither signature for later identification. The instant invention changes the laser wavelength, not the laser amplitude.

The other references of record have been reviewed, and they too do not disclose or suggest the above-discussed wavelength dithering of the present invention.

For example, Jones, et al. disclose an optical wavelength division multiplexing system. In this system, one or more predetermined wavelength signals may be dropped from a trunk and onto a branch, and one or more signals at the predetermined wavelength may be added. A sensor senses the level of the signals dropped and, in response, the level of the added signals may be adjusted to an optimum level.

Jones, et al, though, does not teach wavelength control via dithered feedback, as in the present invention.

Independent Claims 1, 3, 11 and 18 describe the above-discussed feature of the present invention. In particular, Claim 1 describes the feature that, when the network configuration is changed by adding or dropping wavelengths, the resulting change in the optical transfer function (OTF) is tracked, and feedback signals are used to compensate for the change by equalizing the optical signals by adjusting wavelengths of optical signals in the network to maintain a defined optical transfer function in the network.

Claim 3 describes the step of tracking changes to the set of optical signals by dithering the center wavelengths of each of said set of signals, and passing each of the signals with dithering center wavelengths through a filter having a bandpass function to generate filter output signals. Claim 3 describes the further step of using those filter output signals to compensate for those changes by equalizing the optical signals by adjusting the wavelengths of some of the optical signals to maintain a defined optical transfer function in the network.

Claims 11 and 18, analogously, both describe means for dithering the wavelengths of the optical signals relative to the filter bandpass, and to pass the set of optical signals through the filter, to generate filter output signals. These Claims 11 and 18 further describe a control for using those output signals to compensate for changes to the optical signals by equalizing the signals by adjusting the wavelengths of the optical signals to maintain a defined optical transfer function in the network.

Because of the above-discussed differences between Claims 1, 3, 11 and 18 and the prior art, and because of the advantages associated with these differences, Claims 1, 3, 11 and 18 patentably distinguish over the prior art and are allowable. Claim 2 is dependent from Claim 1 and is allowable therewith; and Claims 4-10 are dependent from, and are allowable with, Claim 3. Likewise, Claims 12-17 are dependent from, and are allowable with, Claim 11; and Claims 19 and 20 are dependent from Claim 18 and are allowable therewith.

The changes requested herein to Claims 1, 3, 8 and 11 only emphasize features already described in the claims. For instance, each of these claims already describe adjusting the wavelengths of the optical signals to maintain a defined optical transfer function, and the claims are being amended herein to indicate that this is done by equalizing the optical signals.

Accordingly, it is believed that entry of this Amendment is appropriate, and such entry is respectfully requested.

For the reasons set forth above, the Examiner is asked to enter this Amendment, to reconsider and to withdraw the rejections of Claims 3, 11 and 18 under 35 U.S.C. 112 and the rejections of Claims 1-20 under 35 U.S.C. 102 and 103, and to allow these claims. If the Examiner believes that a telephone conference with Applicants' Attorneys would be advantageous to the disposition of this case, the Examiner is requested to telephone the undersigned.

Respectfully submitted,

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